

May 5, 1890.

REGULAR BUSINESS MEETING.

The President, DR. NEWBERRY, in the chair.

Twenty-five persons present.

The following recommendations of the COUNCIL were approved:—

I. The election as Resident Members of

EDWARD K. DUNHAM.
JOHN TATLOCK.
E. B. DUNN.
BYRON B. GOLDSMITH.

II. The payment of the following bills:

Publication of ANNALS, Vol. V., Nos. 4, 5, 6, and Index to Vol. IV.....	\$359.20
Printing Notices of Meetings.....	28.35
Minor Bills.....	32.45
Stationery.....	20.50

The paper announced for the evening was then read, upon

TERMITES OF THE ISTHMUS OF PANAMA.—PART II.

BY P. H. DUDLEY.

(Abstract.)

In the previous paper on the "Termites, or so-called White Ants, from the Isthmus of Panama," I stated that three genera had been identified by Dr. Hagen, viz., *Termes*, *Eutermes*, and *Calotermes*, the latter being represented by only one species. Since then several more have been found. The species of this genus on the Isthmus have not given any evidence of building exterior galleries, do not break the surface of the wood they are in, and are therefore difficult to find until extensive damage has been done to the woodwork. The principal evidence of their presence is a few partially digested pellets of wood, one-fiftieth of an inch long by one-one-hundredth in diameter, which may be found upon the floor of cars or furniture they are attacking.

Further study of the habits of the different genera of the

termites upon the Isthmus shows that measures which may be effectual against one genus may not be so against another, and in order to carry out practical measures to check their destructiveness it is necessary to designate each genus so that ordinary workmen can distinguish them. In my paper of last year I stated that *Eutermes* was made a subgenus of *Termes* by Heer, owing to the peculiar venation of their wings. This means of classification included in the same genus species having soldiers with mandibles and species having soldiers with beaks, of different habits. On the Isthmus the venation of the wings is not constant, nor can winged insects be found at all times of the year. In my first paper I proposed to call all the species having soldiers with beaks *Eutermes*. This did not avoid the confusion, and I now call them *Nasutitermes*—soldier-nosed *Termes*.

The Genus Termes.—The workmen know, when they break a gallery and find a number of mandibulate soldiers, the nest is likely to be near and inside some post or beam, unless it should be the species *Termes columnaris*, Beaumont, in which case it will be an earth-nest.

The Genus Nasutitermes.—When they break a gallery and find soldiers with a beak, the nest may be a long distance away, 50 to 200 feet, and will be outside of the timbers, and the workmen know they are *Nasutitermes*.

Calotermes.—If the workmen do not find exterior galleries, but a few little pellets of wood on the floor, they know the *Calotermes* are in the wood.

For each genus the treatment must be different, and these simple designations for classification can be readily understood by those who must deal with the subject practically. In the former paper many of the intelligent habits of the termites, especially of the genus *Nasutitermes*, were described and illustrated. Wonderful as they were, continued observations show many more far surpassing in interest those first described.

The large numbers of queens found in a single nest,—from two to fifty-five in the *Nasutitermes*,—is astonishing. In the genus *Termes* not only have a number of queens been found, but the surprising fact of another series of auxiliary queens as well.

In studying the observations of Mr. Charles Lespes upon *Termes lucifugus* in 1854 at Bordeaux, he designated large and small kings and queens. Dr. Fritz Müller, at Itahy, Brazil, in 1872, confirmed Lespes' statement. These statements I communicated to Mr. Beaumont, and had him search for the auxiliary queens, and after opening many nests he found among the species of *Termes columnaris*, Beaumont, and *Termes minimus*, Beaumont, the two distinct forms of kings and queens.

The marked distinction between the two is that the true kings and queens develop from winged imagos, which swarm, and after a short flight alight on trees, buildings, or the ground, lose their wings, and cannot return to the parent-nest by flight. They pair and seek a hiding place.

The auxiliary kings and queens come from nymphæ with aborted wing cases, and are apterous and cannot leave the parent-nest by flight.

This is an astonishing provision of Nature. First, a swarm of winged males and females to disseminate the species. Second, a supply of apterous males and females to keep up the parent-nest in case the first class should all swarm.

It is stated that the auxiliary queens are found with all the genera mentioned, but to date only those of the genus *Termes* have been discovered on the Isthmus. The observations made by Mr. Beaumont since the date of the last paper to July 4th, 1889, have been compiled by Mrs. Dudley into the following paper:—

COLON, S. A., August 4th, 1888.

MY DEAR MR. DUDLEY:—Many of our best residences on the beach are haunted (anted) by the destructive *Nasutitermes*, and we have not discovered anything yet by which we can effectively spirit away the silent intruder. Have you found with your microscope any special organs for secreting the cement so useful to the workers? A suspicion is dawning upon my mind that this cement may be the natural excretion from the alimentary organs, so extensively and economically used to construct their nests and galleries. I am surprised that this peculiarity of the *Nasutitermes* (*Eutermes*) has not been observed and commented upon by naturalists before, as it is one of the wonderful facts about them. They are enormous feeders, and must have well-developed digestive organs to keep up the supply of such profuse secretions.

I am pleased to learn that Dr. Hagen values my observations, and that the name of the ant which destroyed my office window-frame is *Termes testaceus*.

Since my last letter I have opened and examined two nests of *Nasutitermes* (*Eutermes*), and found one queen in each. One nest was located on a dead prickly-palm tree about three feet above the ground, and was two feet long and eighteen inches in diameter, encircling the tree. The lower portion of the nest contained many eggs and larvæ; the upper and newer part, workers and nasuti. No winged ones, and no eggs near the queen. She was in a large cavity, surrounded by a host of excited workers, and near the centre of the nest. The second had a queen, eggs, larvæ, workers, and nasuti (soldiers with beaks) only. I

observed on the queen, with a small microscope, some parasites not discernible with the unassisted eye. She could move freely, with a peristaltic movement aided by the feet, and was about 25 mm. in length.

In adding fresh soil to my termitarium, there was a small beetle. The next day I found it on the surface with its legs, antennæ, and body so stiffened by the secretions of the workers that it could scarcely crawl; they evidently intended to cover it.

On the cocoloba (sea-grape) tree near our shops there is another species of termites, *Termes prælongus*, Beaumont; their galleries look like the *Nasutitermes* (*Eutermes*), but are different, and the workers smaller, more elongated, and the body of a chocolate color, with head, legs, and thorax white. Soldiers with long, slender, black, and slightly reflexed mandibles, colored like the workers, and have, when molested, a saltatory movement, jumping backward and forward from one to two inches; this seems to be done by their mandibles, bringing the points together and snapping them as one does the thumb and forefinger.

Last week I emptied one of my termitariums, about a month old, and found many young, of a transparent white, both workers and nasuti, in good health apparently. These must have been fed, though there was no sign of food or fungus. It is to this end that I am experimenting with my termitarium, to find out how the young and nasuti are fed, and have constructed one with a view to observe their inner life. They have such a habit of shutting themselves up that my plans keep changing. The light does not seem to trouble them so much as the breeze; they are sensitive to the slightest current of air, while a strong light focussed on them by a lens does not disturb them.

I have experimented to find if they hear as we do, or not, but have no results yet. Their sense of smell must be acute; no organ which we possess will compare with it in sensitiveness.

After watching their movements day after day, it is impossible to doubt that in the structure of the antennæ of the termites there must be some combination of the optic, auditory, and olfactory nerve which the microscope fails to reveal. We can then, in a measure, understand their peculiar and intelligent signs and movements; but how they are known in the antennal language, we, with all our knowledge, are unacquainted.

I observe they can detect vibratory movements that are not sensible to our ears or touch, such as the rubbing the outside of the smooth glass jar with finger-nail; this will arouse the nasuti quickly, and they will run around, sometimes stopping before a worker cutting wood, to give one of their expressive jerks of alarm, until the worker starts for cover. This movement is difficult to describe, but they balance themselves on their feet, and

jerk their bodies back and forth very fast; and the soldier, during this movement, ejects the glutinous liquid when attacked by other ants of its kind.

We have a coach under repairs now in which there is another variety of wood-ant, *Caloterms marginipennis*, Latr., which I have not observed before, and am surprised that they could get in the car and do so much mischief while it was in constant use; they had entire possession of the inside door-casing. I send you specimens, and you will find workers, soldiers, small queen (?), and perhaps males in vial No. 6. No. 5 are specimens called in my last letter "the jumping soldier." No. 4 contains two queen *Nasutitermes* (*Eutermes*), workers, and soldiers. The other centipede-like worms were found in the same nest as the queen; they dropped out in large numbers when the nest was broken. No. 2 are the specimens named by Dr. Hagen *Termes albidus*, Hagen. No. 1 were found in the nest where the six queens were found.

The block of balsa wood in which the vials are sent was in my termitarium about two days (forty-eight hours); you will see how they bored into it in that time. So far they have never eaten any cedar. The queens that have been sent you appear about the same in alcohol as when captured.

September 1st, 1888. I have now to record the capture of six queens, *Nasutitermes* (*Eutermes*), from one nest, all about the same size and general appearance, about twenty-five mm. in length and five mm. in diameter. This nest was located on the trunk of a palm tree, and sprouts were all through it, so that it was difficult to open it. The first piece cut was from the centre, about eight inches square, in which were seven queens; one was crushed with the machete. There were eggs and larvæ in every part of nest No. 5, and also winged ants. I started another termitarium with a part of this nest, and in about two hours, when they seemed settled and were working, I introduced one of the captured queens. They at once recognized it, and, to my surprise and delight, commenced to lick it clean, paying particular attention to its head, antennæ, and legs. About twenty of the workers were busy thirty minutes, while the soldiers hurried around in every direction, giving orders and calling for help to drag her into the nest. Like most queens, she had a will of her own and wished to go in an opposite direction; but the majority prevailed, with the friendly aid of the point of my pencil, in getting her into the cell, and at once closed the opening.

September 2d, 1888. To-day I cut up the rest of nest No. 5, obtained a week ago, and to which was returned one of the queens. It had been in a glass jar, and I was desirous to see what disposition they had made of the queen. Cutting with a saw and knife to

a cavity in the centre, I found four queens, much shrivelled and discolored, though they could move quite lively. Before disturbing them I placed cell and all on a clean board in the jar, to watch them. They moved around, apparently in search of a hiding place, always attended by a large number of anxious workers licking and caressing them, and whenever they stopped the workers would attempt to drag them to the cell. You will see that this nest No. 5 contained ten queens, and near them was a small insect of a shape unknown to me, neither worker nor soldier. It seemed anxious to be near the queen or the cavity, so that I call them "maids of honor" (Staphylinidæ).

Nest No. 6 was about two and one-half feet from No. 5 and connected to it by galleries, round in form and about two feet in diameter. It was well filled with eggs, larvæ, winged ants, and the usual proportion of workers and soldiers, but no queens. I think No. 5 was the parent-nest, and the eggs from the ten queens were carried to it through the galleries, as I have seen the eggs taken by a worker as soon as they were voided by the queen, and they give constant attention to her anal extremity.

I have not yet seen any signs of the nodules of prepared food mentioned by Hubbard, and am desirous to know how the millions of larvæ in nest No. 6 are fed.

While in Panama last week I obtained the seventh different species or variety. The nest was built of mud from the road, around the base of a telegraph-pole, and branches from it ran along the wooden railroad fence. Only workers and mandibulate soldiers were found in it. The latter have a different shaped head from the others; body is a dark slate color. These seven varieties of termites are under my microscopic observation and study.

In the report of the proceedings of the Philadelphia Academy of Natural Sciences, November 15th, 1887, there is the following allusion to the termites: "Rev. Dr. McCook referred to a communication from Mr. C. Townsend describing the nest of a white ant found in Honduras; wood pulp seems to be the material used, and the nests are placed between branches of trees."

Your conclusions about the different genera of termites constructing galleries are correct so far as my observations extend. The *Nasutitermes* (*Eutermes*) construct more extended galleries than any of the seven kinds of wood-ants under my observation, for some nests are fifty feet above ground, with galleries leading to them.

September 12th. I examined two nests on the beach. No. 8, a small one on a stump, contained about two dozen wingless ants, which I think were females, and I captured six of them. Nest No. 9 was about twenty rods away, and on top of a decayed root of a

tree. It was round, about two feet in diameter, and looked old. This was well supplied with eggs, and near the centre were six queens, somewhat shrunken and of a brownish-yellow color. (These are in the bottle with the six Staphylinidæ.) I took three of these queens, to experiment with those in my termitarium, under observation for three months. At 2 P.M. on the 12th of September, 1888, I put in a queen, which was received with attention, and caressed, washed, and apparently fed by both soldiers and workers; in a few moments it crawled into the nest and was lost to view. A female from nest No. 8 was well received. At 7 P.M. I introduced three queens and five Staphylinidæ from nest No. 8, about fifteen minutes apart. They were all greeted like the first, except more turned out to receive them. Very different, however, was the reception to a worker accidentally dropped among them. It was pounced upon and maimed, as were workers introduced for experiment.

After four days I dissected my termitarium to find the introduced queens. They were nearly at the bottom and centre of the nest, in a little hollow, and several of the Staphylinidæ also. Near by was a cluster of *new-laid eggs*, enough to cover a ten-cent piece. I looked at them with the magnifying glass, then carefully replaced the parts of the nest. They seem contented and do not try to escape.

September 15th, 1888. I send you, by Mr. Farrington, some samples of the work of *Nasutitermes* (*Eutermes*). The varnished piece is from a passenger-coach. The ants in the bottle came from nest No. 5, and have been under my observation for a week. The red paint shows the place in the nest where the queens were found, and you can see the sprouts of coca palm running through it. The Staphylinidæ—my “maids of honor”—are in a bottle (*Termitogaster insolens*, Casey).

September 21st, 1888. In answer to your questions received by the last steamer: 1st. With regard to finding a male attendant in the queen's cell, I have found several wingless ants in the large nests where there are several queens, but I am not sure they are attendants. Breaking into the centre of a nest is a slow operation and disturbs them and the wingless ants; male or small females are very active.

Oct. 2d. What were the parasites on the queen? They looked like minute lice, and lodged in the joints behind the head, and sometimes could be seen running over the body. To-day I noticed a worker acting as if in pain, and trying to attract the attention of its mates by violent jerks. Two or three came and licked at it, but did not seem to relieve it, when in desperation it rushed to a worker and licked it, and then held its head down for the same purpose. It also rubbed its head with its forelegs, then

ran around until it came near enough for me to use my double lens and see the parasite on its forehead between the antennæ, in what seems to be a dividing line. This parasite was brown in color, but about the same size as the white ones. I observe that the workers spend more time washing each other since the adoption of the queens, perhaps on account of these parasites. I have not found the nest of the "jumping soldier," but it enters the trunk around a decayed knot-hole. The limbs of this tree are all hollow—a naturalist's paradise; three species of wood-ants,—*Nasutitermes* (*Eutermes*), *Termes testaceus*, and No. 20, besides swarms of others.

There is something unusual in the termitarium to-day, September 21st, 1888, and it may be death, as I crushed many the time it was opened to see the queens. Six of the sexual individuals clustered together to-day, while the workers were apparently building an enclosure for them, which was finished in a few hours.

October 4th, 1888. I read the article in the *Scientific American* you sent me last steamer; it was in the main well written, though the observations have been hastily made. Some of the illustrations are wretched, particularly the worker. Such mandibles,—and showing them at work! The writer (or author) evidently never owned a private termitarium.

I have examined two more tree-nests with some profit, but have had an unpreventable mishap to my termitarium, and the little things seemed lost when turned out of it; and I have felt the need of the familiar object of study on my centre table, though I have gained from them much "food for thought," stored beyond loss. I often think, while riding by these unpretentious and apparently lifeless termite tree-nests that form such a conspicuous feature of the Isthmian landscape, how little people know of the hidden life within, of the well-regulated family of workers and young, guarded by a watchful army of soldiers, and whose chief centre of attraction and solicitude is a lovely queen pregnant with a progeny of untold millions.

To an intelligent observer and lover of nature there is a profitable train of thought in one of these skilfully constructed nests. The methodical habits; the covered galleries thronged with busy workers; the watchful care of the young by washing and feeding; and the solicitude for the helpless queen,—ready to die for her! It is marvellous, and shows a high degree of intelligence and affection. As a proof, my queenless nest, under my observation for four months, has adopted, without hostility, several queens and sexual individuals from strange and widely separated nests, even with amity and good feeling, while

workers and soldiers from the same nests were pounced upon and despatched as enemies.

January 14th, 1889. There are now two first-class passenger-coaches in the shop for repairs, damaged by the *Calotermes*, and in the same place as the other sent you,—the inside door-casings. This seems remarkable. The *Nasutitermes* (*Eutermes*) were at work (during my absence of two months) on a large pile of 1½-inch clear redwood stacked up in the commissary's yard, and of course cannot be destroyed without restacking the whole pile. They started in the *white-ash strips*, and did not eat the redwood. I saw a large pile of 6x10x20 yellow pine which the commissariat said "was excellent lumber, well-seasoned, stripped, and protected from fungus," but my experienced eyes recognized the *Nasutitermes* (*Eutermes*) at work on the ash strips, and with my umbrella I showed him that they were at work all through the pile, branching from the strips to the yellow pine.

The foreman in charge of the repairs on the inside of the church preserved for me a part of a plaster-of-Paris bracket eaten by termites, which is an interesting specimen, because they tunnelled the lower part, instead of running over the surface to reach the wooden pillar twelve or eighteen inches above. From the appearance of their work and the inconspicuous empty galleries, I think it must be *Termes testaceus*.

I have just made an examination of the bath-room in the superintendent's house, which was completely renovated a year ago, ceiled entirely with white ash, and varnished. All the termites were destroyed with kerosene, but no attempt made to find the nest. Now it will have to be entirely repaired, and I have advised the superintendent never to use another piece of ash in the house.

I have now two termitariums in which to continue my observations, which will be recorded and sent as you desired me to do.

The magnificent cocaloba (sea grape) tree on the beach is in full bloom, and I picked Mrs. Gen. Newton a bouquet from it to-day, as I did for Mrs. Dudley when she was here nearly two years ago. The knot-hole where the specimens of the vaulting soldiers were found has been taken possession of by *T. testaceus*, and the hole plugged up by them with earthy matter.

January 21st, 1889. The portion of rafter sent you was two feet longer on the eaten end, but dropped off in pieces when taken down. Both nests sent were in the timber. The life of the *Nasutitermes* (*Eutermes*) is gradually unfolding to me, and when we know enough to write their life history it will be wonderful. The workers in the communities have duties in excess of what first appeared before using the microscope. A

queen has been laying eggs for four hours under my observation, and averaged about *eight per minute*, one at a time, in rapid succession; then again slower, with periods of a few moments' rest. It is interesting to see the eggs, under the microscope, pulsating before the embryo ant can be defined. To-day I had photographed the largest *Nasutitermes* (*Eutermes*) nest yet seen by me; it was ten feet high, and in the corner of a shed. It will be a treat to break it up and see the inside.

The mud nest at Panama has disappeared, also the telegraph-pole. Query: Which went first? There is a new pole about a rod distant. A few miles north of Panama I found another conical mud nest, about three feet high and three feet in diameter at the base,—without doubt the same species as the former.

The stairs leading to the church-tower are built principally of Spanish cedar, with some pine. The ants eat the latter close to the former without touching it in a single instance, nor has the Spanish cedar decayed at all. I enclose a fine piece of veneer by the master-worker *Nasutitermes* (*Eutermes*); it is the remains of the upper side of a lime-barrel head,—the lower side was the same,—also a piece of stave from the same barrel.

February 3d, 1889. Last week I had to go across the bay to "Kenney's Bluff Waterworks," and went into the mountain, and in a short time found a termites nest similar to the fragment sent to you; it is the only kind that is not a *Nasutitermes* (*Eutermes*), brownish in color, with smaller septa. I was fortunate in securing the queen and the nicely constructed cell,—not a "cavity left among the septa," as one writer says, but a roomy cell that you will be delighted to see. The queen resembles those of the *Nasutitermes* (*Eutermes*) in general appearance, the abdomen of finer texture, head and thorax smaller in proportion. Only one soldier was captured, but many workers and immature winged ones.

This morning, taking the advice of Solomon to go to the ants and consider their ways, I opened two *Nasutitermes* (*Eutermes*) nests, made observations, and took a queen from each. In the centre of one nest a twig of a dead shrub had been incorporated, about one-half inch in diameter; the centre had been eaten to the thin bark, and here was the queen fitted nicely in her bark house.

This nest,—illustrated in February number *M. Journal*.—I found on the beach this morning, built on the dead trunk of a small tree, about two inches in diameter and about eighteen inches above the ground. The trunk was honeycombed by the ants, and I broke it off close to the ground and put it into my six-by-nine glass jar, two-thirds full of moist soil around the trunk, with two white-ash braces, and all standing in a wash-bowl

partly filled with water. This is the *ne plus ultra* termitarium; its census has not yet been taken, but it must be in the millions, as they are swarming over the surface of the soil and pieces of ash for food, and delving down, seemingly to find the foundation of their new home. I have mounted three termite parasites on one slide, taken from the queens captured to-day, and they look well. The glycerin jelly is better here than the Canada balsam.

February 14th, 1889. Your letter, with a copy of one from Dr. Hagen to you, came last steamer. He seems to be puzzled about species. When I am dissatisfied with the progress of my observations, it is comforting to know that he is in the same dilemma and is making haste slowly. I send you two photographs of the large nests, one of which please give to Mr. Riederer. When I think of the immense weight the little workers have eaten and digested beyond what was necessary to support life, it is astonishing.

Capt. Lockwood, Mr. Clark, and Dr. Sturgis, officers of the *City of Para*, were interested in seeing the two rows of soldiers, ten inches long, with the little workers between plodding away in single file building galleries, and all expressed their admiration and astonishment. I will send you by them another sample of the *Calotermes marginipennis* found in the seat-frame of a first-class coach. There were twelve seats damaged, and we cannot explain how they got there; and thus far none have been found elsewhere.

There has come to me to-day a curious nest occupied by black ants, built of mud and some glutinous substance, and stuck on a twig of an orange tree; it is about three inches long, globular in shape, with a number of holes for entrance, one-quarter inch in diameter, and heavy for its size.—evidently a hornet's nest.

The *Nasutitermes* (*Eutermes*) in the "*ne plus ultra*" have built two bridges, running the gallery over the top, and started the third one to-day and running it underneath. I have found a nest with *twenty queens*, about three-quarters of an inch long, and think it must be a parent of several nests. With a block of a *Nasutitermes* (*Eutermes*) nest I tried the experiment of wrapping it in a damp towel. After forty-eight hours I unfolded it, and found they had eaten their own nest and rebuilt or covered up the ruptured passages.

I send you with the photographs some native oak, also the seat-frame eaten by *Calotermes*, and suggest that you cut it up, for fear there may be live ants in it.

March 12th, 1889. To-day, on the steamer *Newport*, a gentleman from Peru gave me an account of the *Calotermes* work-

ing in his trunk. He discovered them first by the little round pellets of refuse that they pushed up as they were working downward through the cover of his trunk. He described them as white, and some of them had short wings. If this is true, it is easy to account for their finding a home in our coaches, as you suggested. He knows the *Nasutitermes* (*Eutermes*) by their nests and galleries, but has not observed them in Peru or the high lands of Mexico. This confirms a conclusion that their habitat is governed by altitude as well as latitude.

March 23d, 1889. Another passenger-coach has come to the shop for repairs; end sill decayed, door and window posts of one end eaten by the *Calotermes marginipennis*, one tenon eaten off entirely. Took out the whole end of the car and found some nymphæ among them. Yesterday the carpenters tore down a part of balcony considered unsafe in the rear of superintendent's house and near the bath-room, and found a *Nasutitermes* (*Eutermes*) nest between the floor timbers of the second story. This explains the work of these ants on the ash ceiling of the bath-room.

There is a part of a decayed log in our lumber-yard that is in possession of the vaulting termites; it also contains eggs and nymphæ, but have not yet found a queen. My clerk says that he visited the photographed nest and found the ants rebuilding, having covered the top, on which was poured carbolic acid.

April 2d, 1889. I am now making observations of the *Termes praelongus*, Beaumont (jumpers), and have found a branch nest of this species in the old stump, but think there is more of it. I have obtained some winged jumpers just able to fly; they would no doubt be able to swarm next month. They are much smaller than the winged *Nasutitermes* (*Eutermes*) or *Termes testaceus*. In breaking the nest in the stump, in pursuit of the queen, I found thousands of young workers, but very few soldiers; many white nymphæ with black eyes. Fresh eggs were numerous, but no queen visible. I think she will be smaller than the *Nasutitermes* (*Eutermes*), and, from the trouble and labor in search of her to date, she ought to have the financial value of an eagle. To verify my conjectures in regard to the feeding of the young of this species, I placed fragments of the nest in a clean jar 6x9, without any soil, the bottom of the jar being slightly convex.

The baby termites travelling about the ruptured nest dropped from above to the bottom of the slippery jar, and gravitated to the lower edge in large numbers, and were unable to climb to the nest, which rested on the centre of the jar; so the little mites huddled together, and the workers came down to them, and

as soon as they felt them approach they made an effort to get to the workers' mouths; sometimes two or three struggled for the pap, so that after watching them I have no faith in the "fungus theory." For these frail, transparent young could not nibble the hard nodules found in the Jamaica tree-nests. I do not say that this material is not used as food for young termites, but that the young are unable to make use of it themselves. I have never yet found fungus of any kind in the nests, and besides have mounted some young, and can see under my microscope, in the gullet and abdomen, food-grains of a more solid nature than fungus. Hence this conclusion: that they are fed by the workers with food prepared as wanted by them; and I doubt whether any other person has ever had the rare chance of seeing these little young termites as I have seen them during the past few days.

April 14th, 1889. I have been in the jungle and made additions to my collections,—notably two Staphylinidæ and one white ant guest. Many decayed stumps were swarming with the *Termes praelongus*, Beaumont (jumpers), but so far have not found a queen,—though I have all others of that species, from the eggs to the perfect winged ones,—and find that *T. praelongus* workers eject cement from the abdomen to cover their work, similar to the *Nasutitermes* workers. So far no galleries have been found; they seem to cover entirely, that is, the rotten stump. From three *Nasutitermes* (*Eutermes*) queens I took off eight parasites, and mounted all on one slide in balsam.

Further observations of *Nasutitermes* (*Eutermes*) queens during oviposition show two apertures at the extremity of the abdomen; from the upper is emitted the watery discharge, which is in periods of a minute, the fluid trickling upon the eggs discharged from the lower aperture and keeping them moist. Please mention this to Mr. Riederer, as it may be important in the study of the anatomy of the queen.

On the 12th of April, 1889, I witnessed the first swarming of the winged *Termes*. The first rain of the season, of forty-eight hours, had abated; at 3 P.M. the air was still, and I predicted the appearance of the winged ones before sundown. At 4 P.M. there was a swarm of swallows near our paint-shop, and the winged ants were swarming from the ends of the coal-bin timbers at the rate of about one hundred a minute. They were the *Termes testaceus*, and came mostly from a crack in the end of a 12x22 timber. Around this crack were the soldiers, with heads out and mandibles open, and when touched would eject their milky fluid. They seemed to guard the entrance against enemies, and it was interesting to watch the winged ones squeeze out by them, the soldiers remaining motionless. Many were captured on the

wing by the swallows, and others were carried off, as soon as they alighted, by the common ant. At 6 P.M. they stopped issuing from the cracks, and the openings were sealed, and no more from this colony have since come.

We still find the *Calotermes* in our coaches. People here, in hearing me speak of the ravages and insatiable appetites of the termites, ask if it is new, as they never before heard so much complaint. They have been blind or heedless to the destruction they caused, for the termites were here to greet Columbus, and the teredo destroyed his vessels.

April 14th, 1889. I was in the jungle to-day, and found the central part of several *Nasutitermes* (*Eutermes*) nests containing the queen cell. I split one open lengthwise and took out all the termites. A few days later, while searching other nests, obtained at the same time, for *Staphylinidæ*, many eggs and workers were jarred on to a plate with dirt, and then thrown into an empty jar to destroy. Noticing the workers picking up the eggs, I put the empty block of nest in, to see if they would use it for a repository for their eggs. This was at night, and in the morning, upon raising the upper portion of the nest, I found every egg had been removed, cleaned, and stored on one side of the queen's cell. Now, these Termites had been without food for five days,—unless they had eaten their nest,—and been much disturbed, yet at the risk of their lives they had saved the eggs from destruction.

April 22d, 1889. To-day I investigated the seat-rail, companion to one you sent in February. This had been jarred to get out the *Calotermes*, and I did not expect to find many. I sawed it into lengths of five inches, jarred a piece endwise into a glass dish, and out flew a perfect winged one into the room; it was secured. From that seat-rail—supposedly empty—I got about 1,500 nymphæ, 14 soldiers, and 72 perfect winged ones; the latter were active, and some escaped. I was particular to count them from each piece, to get the proportion, and noted the small number of soldiers. The winged ones are smaller and shorter than the nymphæ, and there is a difference in the venation of the wings between this species and the *Nasutitermes* (*Eutermes*), and when mounted are transparent and reflect colors under the microscope. Do you know whether Dr. Hagen has any of these in his collection? Because their habits are so retiring it makes them seem rare. A very young queen was found and has been placed in a jar with some of the wood for further developments.

April 24th, 1889. My observations to date show only two species that construct long galleries,—*Nasutitermes* and *Termes minimus*. The next species among the architects is *Termes*

prælongus, but they try to cover their work, leaving a space behind the plaster about three-sixteenths of an inch. The *Termes minimus* often construct as you illustrate, but frequently like the *Nasutitermes*. I have five *Staphylinidæ* from the last *Nasutitermes* nest, and also two of the little white guests; these seem to be the only strangers met with in the central part of these nests.

From further observations on the *Calotermes marginipennis*, I assure you and Dr. Hagen beyond doubt that the imago does have a lobe between its claws, by which it can run up and down a window-pane or the vertical sides of the glass jar in which my first specimens were with difficulty placed.

This power, that other species do not possess, reminded me that Dr. Hagen is recorded as searching for it, but did not find it, and that you had found the rudiments of a lobe in a nymph. The Doctor's specimens may have been imperfect, for a side view of the foot shows the lobe or sucking disc.

Other results of observations of this species are that they have no workers, that the nymphæ while young have no visible signs of eyes, wings, or lobes between the claws, therefore they cannot see, fly, or crawl on slippery surfaces, nor have they any use for these organs at this stage of life.

The nymphæ at first are like grubs, fat, sluggish, and repulsive to the eye; they gradually change, while performing destructive work, to perfect insects,—black eyes, graceful bodies, iridescent wings, lobed feet, and beautiful to the eye. Imagine, if you can, “the swarming” of thousands of these *Calotermes marginipennis* issuing forth from the seat of a passenger-coach in motion, on any of the trunk lines in the vicinity of New York! I wish you would show Mr. Adams, the Boston & Albany's car-builder, the work of these pests in my coaches, for in spite of all I can do it seems impossible to get rid of them.

May 2d, 1889. I am now observing the *Calotermes marginipennis*, and find them as interesting as the other species, while their habits are different. In a first-class coach in the shop for repairs, the *Calotermes* are at work in two places, and the seat-rail is a fine specimen of their carving.

I observed the cutting and masticating process of the jaws. The toothed or anterior portion of mandible is used in cutting and tearing the fibres of wood, and the posterior is for grinding and masticating it. To observe this I made a *calotermarium* which has answered the purpose, by placing a piece of seat-rail one and one-half inches long, with a pocket in which were a few *Calotermes marginipennis*. Then with a penknife I drilled a hole endwise in the block about one-quarter of an inch dia-

meter and three-eighths inch deep; then with a camel's-hair pencil, moistened at the tip, I lifted seven to the edge of the hole. They enter head foremost and work at the bottom, seeming contented. Among them is one soldier,—one imago of a brown color without wings. By placing this block on the stage of my microscope, with a two-inch objective, there is a good view of the workings of the mouth parts, especially as they are slow in the movements of their mandibles. I note that when sleeping or resting the anterior part of mandibles remains partly open, while the posterior part is closed. When the mandibles are at work they have a cam-like movement, thrown outward while coming together.

Another strange thing is that they have two secretions from the abdomen, one the hard, round pellets, and the other a soft, pasty substance which is eagerly devoured and also used as a cement. They not only take it from each other, but double up and take it from themselves, and then slowly work the mandibles until it disappears. Query: Is it possible that the ligneous food has to pass through the system twice before it can be perfectly assimilated?

I am pleased with the confidence you expressed in your letters in the truth and correctness of my observations, and their value scientifically and financially. Your appreciation of my difficulties in the decay of wood in this climate, and knowledge how to check it, suggestions and assistance about the termites, have been to me a great benefit.

I send you another balsa block containing four vials. No. 101 contains eggs, soldiers, workers, nymphæ, and immature winged ones of *Termes saltans*; No. 100 are beautiful specimens of perfect winged ones, *Termes praelongus*; No. —, perfect winged imago *Calotermes*. The vial without number contains what I got out of coach in shop for repairs.

I shall be pleased to read Capt. Casey's description of the "maid of honor." I have only seen so far this season two "marriage flights" of the *Termes*, and it seems to me to be a sentimental description of the dispersion of the sexes from the parent-nest, for at this time, in my observations, the congress of the sexes seems to take place in the nest, and previous to swarming, to form other colonies. They have enemies; the flight is of short duration; no time to waste on the uncertain congress of the sexes on the wing, as they seem to hie to cover as quickly as possible, and it is more in accordance with Nature's laws that the female should issue forth from the parent-nest in a perfect condition to form another colony.

May 14th, 1889. The interesting monograph, "Termitogaster insolens," by Capt. Thomas L. Casey, is just received, and it is the finest collection of descriptive words that I have seen, and I hope to have a description of the other termite guest—the white one—which is found among the *T. testaceus* also.

The timbers under the water-tank that stand on our coal-bin were much decayed. They were of sound yellow pine, and had been in use for five years. The weight of the tank had squeezed them together an inch, and on taking them out there was a premature flight of *T. testaceus* at the same place as one described to you a month ago. It is evident from this that there may be several swarms in one season.

The Rev. Mr. Geddes, from Jamaica, in looking at my calotermitarium, said he had frequently seen the same work there on ash and kindred woods, but they called it "dry rot" and did not think it was the termites. I showed him a bottle containing about 2,000 *Calotermes* taken out of one piece, and it convinced him, and he intends to send me some observations.

My *Calotermes* are a happy family. I can coax them out of their nest to have their heads and faces smoothed and washed with a moistened camel's-hair pencil, and sometimes they will playfully take the pencil in their mandibles if I press too hard. When fully developed they have perfect *wings, eyes, and lobed feet*, and I have a perfect winged one, or imago, that shows reflected light under the microscope, while the nymphæ does not.

May 24th, 1889. There is so much of interest about the termites that I am bewildered with astonishment and scarcely know where to commence or end. I am glad to hear that Mr. Riederer's careful studies and dissections of the nymphæ confirm my observations in relation to the gradual development of the *C. marginipennis*, and it is probably gratifying to him to know that our conclusions are the same, reached, as they are, from different methods of study,—his from the dead specimen, and mine from the living in its habitat.

I have found another parasite feeding on the dead *Nasutitermes* (*Eutermes*) in my termitarium. It is horrible-looking, with claws on its feet, and hairs on the abdomen larger than the first parasite noticed. There are hundreds of them, and as there are only a few soldiers and one Staphylinide, it may account for their increase, as the latter may prey upon them in some stage of growth.

As the calotermitariums are deepened and out of the focus of my microscope, I start others on the surface, and move my

tame *Calotermes* into new quarters for better observation, without any difficulty. If at first they attempt to leave the hole started for them, I can drive them in with a camel's-hair pencil, and now have some of the smallest termites (Nos. 34 and 35) under observation.

Yesterday I saw a termites nest on some blocks of masonry about eight feet square, built about six years ago on wooden ways, with the object of launching to form a breakwater, which was not done. The *Nasutitermes* (*Eutermes*) got into the wood, and hence the nest against the masonry. They are different in color from any species yet collected, being reddish.

I do not think that there is a stick of decayed timber in our shop-yard that has not received a stab from the blade of my knife or point of my umbrella; and to-day, in passing a decayed fence-post, I split off a portion and found two wingless termites close together. They proved to be *Calotermes*, and I prepared a block of ash one and one-half inches square, bored a hole in it, and in thirty minutes they were busy eating and smoothing the sides of their new nest, and have allowed me to wash them with a hair pencil. They have two white ocelli over their black compound eye, and I can see rudiments in the nympha. They are valuable acquisitions to my termitarium for observation, because they are quiet and amiable. They have lobed feet, the lobes being quite prominent. There was no other termite of this species on the post; they seemed to be alone, and may have fallen during the marriage flight. There were a few common ants near the foot of the post, which had a nest with eggs and larvæ.

I have recently discovered a number of nests of termites of the mud-nest species on a plain of pasture. They are of all sizes from three feet downward. The tops of the nests are watch-glass shape, and have so far only been found near Panama.

Your advice to use California redwood was judicious, for so far I have not found the termites eating it, and it does not readily decay.

June 4th, 1889. The captured queens *C. marginipennis* are doing well in an ash block that can be opened lengthwise. They laid three eggs after a week, and as two disappeared I separated them. They show no disposition to leave the cell under my scrutiny, but keep turning the eggs,—showing that the queens of this species take care of their own eggs in the absence of the workers, and therefore the number of eggs of each queen is limited. When it is understood that every termite that comes to maturity, with the exception of a few soldiers, is

male or female, the latter may exceed in number the other species, and thus make up for the small number of eggs to each queen.

My observations here on the Isthmus of Panama do not confirm the fungus theory, applied to these termites, as the origin of the pellets. I think I have seen them voided. I have prepared a longitudinal section of a short piece of a seat-rail containing a few nymphæ of *C. marginipennis*. In a few days some of the little pellets were pushed through a little hole at the rate of thirty or forty per minute. These pellets are usually the only outward sign we have of the inward presence of this species. In the above section of seat-rail there are three pockets filled with pellets, partly to get them out of the way and to prevent the entrance of intruders. And in another pocket is a pin-hole, made for getting rid of the refuse; and you would have smiled to see the neatness and despatch of the operation.

I was invited to Panama to inspect a set of imported furniture ruined by *Calotermes marginipennis*. When I broke off one of the legs of a chair, the winged imago flew out very lively. The owner said the wood was European hickory. I also saw an ash extension-table affected by the same species, for which so far no remedy has been found.

June 2d. I opened some mud nests and made close observations of their contents, and secured imago, two queens, and several *virgin queens* (auxiliary queens), and for the first time found two species of termites occupying different portions of the same nest. I have hunted for this in the hundreds of nests examined of other species, and this mud nest confirms what Dr. Hagen has stated. The only species of strangers I find in the mud nests is the smallest termite yet seen here (*Termes minimus*), and the difference between the two kinds could be easily noted. In the six nests opened, the *T. minimus* was found in three out of the six. Some of the eggs were found, showing that the queen was not far away. These *T. minimus* live in septa or cells connected by small galleries, completely shutting out the rightful owners. These septa and galleries are lined or whitewashed by the strangers with their secretions; so, upon splitting open a portion of the nest, wherever the white cells appeared there were the *T. minimus*, so that there was no intermingling of the two species. The septa not occupied by the strangers were the natural color of the mud—red clay. The white lining of the septa under the microscope shows the work of the *T. minimus*. Twice when the nest was opened I saw the soldiers of the mud nest besiege the strangers, but no sign of any further hostility was shown.

I also found what I at first supposed was the trunk of a dead tree, about four feet high, looking as if coated by the mud ants, but examination showed that it was a column of mud. In this I found a few *T. minimus* contesting possession with the mud ants, *T. columnaris*. I took a piece of the columnar nest and planted in my garden for observation. The whole nest was about four feet high, six inches diameter at top, and about fourteen inches at base. I sawed off a section. The *T. minimus* were not found inside this column, only on the outside. I am positive there is no connection of septa or galleries between the two kinds of termites. I was hampered in examination of mud nests in the open savanna by the hot air, my umbrella, spectacles, bottles of alcohol, and eyes blinded with perspiration. I found no queen cell in the mud nest, and the little, undeveloped queens found are *white, slender*, and without the colored bands on the abdomen of the Nasutitermes (*Eutermes*), and were found on the ground, in the hole made in opening the nest. One of them is nine mm. long, the other seven mm., and nearly three mm. diameter through abdomen, and, while of the same general form of the Nasutitermes (*Eutermes*), are smaller.

If I should write you all the interesting things I see among the termites, it would read like a Munchausen story, and therefore you only receive from me plain facts of observation. I will write you my experience with a large black ant in my termitarium, which I captured in its nest in my garden with three grubs or larvæ. I put it in a vial one and one-half inches long and half an inch wide, without neck, and kept the cork in for thirty minutes. It began to clean the larvæ, so I took out the cork and laid the vial horizontally in the bottom of a jar. In ten days she has been seen out only five times; one of the larvæ has passed into a pupa, the second is growing, and the third died and was buried or eaten. The ant has laid seven eggs, and is attending them while feeding the larvæ, and has nearly filled the mouth of the vial with grains of sand and soil, leaving just space to go in and out, but does not attempt to run away. Whenever I find her out, when approaching with my hand lens, she rushes to her nest, and with her long, elbow-like antennæ gently touches each egg, larva, and pupa to see if they are all right. I feed her on mosquitoes, termites and their eggs; and this noon I saw her holding one of the latter up to the mouth of the larva, but as it did not take it she laid it down within its reach. A hen brooding its young never showed more anxiety than does this ant in watching hers. If I touch the glass gently, the tips of her antennæ will touch each one to see if any injury has been done. I never find these ants in company with others of their species. Are they not all a fascinating study?

You were right about the queen of the *C. marginipennis*. I have had a nympha pass from that condition to a perfect imago in the calotermitarium, and then to a queen, and now expect her to lay. I have six calotermitariums under observation. I have some *Termes minimus* making small galleries for me, and have one of their queens in her own cell under my observation, having made a glass window to it; they soon drew over it a curtain of cement, but what I saw was wonderful.

June 14th, 1889. To-day I have a man, with a bucket of ferno-line and a long syringe, trying to destroy the *T. testaceus* in our lumber-house. They are in it in large numbers, and I am daily convinced of the rapid destruction here of lumber and buildings by the united action of termites and fungus. I have under observation some bumpers made about four years ago, of sound yellow pine and tarred. Now I can crumble them in my hand. So far the *Nasutitermes* (*Eutermes*) and *C. marginipennis* are the only termites that attack *sound* lumber under my observation *here*, as I have never found *T. testaceus*, *T. praelongus*, or *T. minimus* at work on any other than decayed wood. *Nasutitermes* (*Eutermes*) are commonly found on decayed wood, and *C. marginipennis* on sound lumber.

While over the railroad yesterday I noticed at San Pablo two storehouses owned by the Panama Canal Company had collapsed from the effects of termites; the roofs had fallen, while the gable ends were standing. At the Fox River shops I found last week the man in charge burning *Nasutitermes* (*Eutermes*) nests found in the numerous buildings, and he had a large bonfire of them.

I was interested to read of your interview with Dr. Hagen in the Agassiz Museum at Cambridge, and wish I could have been with you to see the doctor and his collection. I send thanks to him for the African specimens, *T. bellicosus*, he gave you to send to me.

In an old *Nasutitermes* (*Eutermes*) nest from Frijoles I found a number of Staphylinidæ, and other varieties of ant guests. I took many hours in examination of this nest, and the centre vial—No. 20—contains five specimens of new ant guests unknown to me, and they may prove to be male Staphylinidæ. When it was jarred on a white plate while running, it carried the extremity of the abdomen turned over until it touched the thorax; but when touched it would work it back and forth as though getting something from it. Being active, it was difficult to capture, and seemed to be on intimate terms with the workers and soldiers; as also the Staphylinidæ, running to them for protection and seeming also to converse with them.

No. 22 contains two more kinds of ant guests from the same nest, three dark ones and one lighter in color; the former may prove to be the imago of the white guests, which you say are nymphæ. Please send some of these to Capt. Casey.

No. 20 contains five Staphylinidæ and a number of white guests. I hope these will reach you, as I was at some pains and trouble to get them and may not be able to replace them.

No. 23 are not from the Frijoles nest; I retain those Staphylinidæ here. No. 13, *T. testaceus* imago; No. 17, *Nasutitermes* (*Eutermes*) imago; No. 35, imago, workers, nymphæ, and a virgin queen from Corozal mud nest, and forty eggs from the same. This is a fine collection. The long vial is a worker *Nasutitermes* from my termitarium that is covered with parasites; they are on its body, legs, and antennæ.

Like you, I have also found a male *C. marginipennis*; its color is different, like old gold, and the thorax of different form and about seven mm. in length. It was found with a queen in the dining-table from Panama.

The largest number of eggs *C. marginipennis* queens laid under observation has been three; the first one laid is cared for by the queen like a hen with one chicken. I am anxious to see signs of life in the egg, and when I take it and put it under the microscope the queen soon misses it and leaves her cell to hunt for it.

June 23d, 1889. I have a new "*ne plus ultra*" calotermitarium,—an ash block three inches long, one and one-half wide, and one deep. A microscopic glass disc is fitted on the upper surface in a groove; under this is an excavation of three-quarters of an inch in imitation of the natural pocket this termite makes. I have six of these blocks numbered and contents noted. One has queens, nymphæ, males, soldiers, and larvæ; another, fresh-laid ova; a third, nymphæ that have shed the skin and emerged to beautiful imago. Two metamorphoses occurred last night, and I have mounted the skins. These old skins crack lengthwise of the abdomen; then the white imago backs out, leaving a perfect shell of mandibles, maxillæ, palpæ, legs and claws with indistinct lobes. One of the mounts shows all this, even to the cutting edge of the mandible. The young larvæ follow the nymphæ and take their pap from the extremity of the abdomen. No fungus in this dry wood, and the baby termites feed the same as the older ones do.

Rev. Mr. Geddes brought me some specimens this week from Jamaica of *C. marginipennis*, with this statement: These specimens were taken from a white maple board used for slicing bread about three years. He noticed a few pellets, and upon

splitting the board found a pocket full,—several hundred nymphæ and six soldiers. One-half the board he brought to me. The board is about ten inches in diameter and has been turned in a lathe. The nymphæ look like the car *C. marginipennis*, but the soldier is different, with a dark body like the mature queen, head and mandibles darker and of different shape. I put an Isthmian nymphæ with four Jamaican, but they locked jaws and it was soon *hors de combat*. As I have never seen the Isthmian *C. marginipennis* quarrel, though mixed up from different localities, it is possible that these from Jamaica are of another species.

This morning I opened a tree-nest of *Nasutitermes* (*Eutermes*) from Frijoles. The septum of the interior was very fragile, while the outer portion was thick and tough. The nasuti had red heads, and the few imago captured had brown wings. Interior of nest brownish-colored; evidently another species. The queen was of the usual form. Did you note the coincidence of our letters in explaining Fritz Müller's composite nests? I have already told you of finding two species in one nest, one an interloper adapting a part of the nest to its own use, although it had not constructed any portion of the nest.

July 2d, 1889. In passing the sea-grape tree to-day my eye caught some fresh pellets in a depression of the trunk, looking like those of *Calotermes marginipennis*. I cut a piece of the bark, made a hole with forceps, picked out a soldier and worker; the former is a *C. marginipennis*, and the latter looks like *T. testaceus*. In a few moments I had specimens of three different species, taken within an inch of each other, and tracks of *Nasutitermes* (*Eutermes*) were near.

I also found near the Mechanics' Lodge, on a fence-rail, a new *Nasutitermes* (*Eutermes*) nest, and on taking it down there was a teaspoonful of fresh eggs on the rail. In splitting open the nest a plump young queen about an inch in length dropped out.

I am now studying the number of times the *C. marginipennis* moults before reaching the imago. Some of the moults have wing-cases and others have none. I have seen the operation under the microscope, and have assisted some of them through the ordeal, and they are also helped by the nymphæ. It takes about fifteen minutes, and is wonderful to see through the glass. I have no doubt but what the nymphæ of all termites undergo similar progressive metamorphosis, but, from their nature and habits, cannot be so closely observed. I have now twelve blocks of them under glass, and can put them under the microscope at any time.

I was glad to read in your last that Dr. Hagen modifies his assertion relative to several species occupying the same nest, and that my explanation agrees with Fritz Müller's. I have the two species at work together in two glass jars with a bridge connection, and they both have built an independent gallery on the underside, and this is a curiosity.

July 4th, 1889. This morning, while probing the coccoloba tree on the beach, my knife entered a cavity and exposed a household of termites,—two sexual individuals, with a family of eight small larvæ. I hurried them into my termitarium to make an examination, and believe that I have father, mother, and eight children—*larvæ*. What a find! They had evidently just commenced housekeeping and are *Nasutitermes* (*Eutermes*). Their little house was an excavated globular cavity, about three-eighths of an inch diameter, in the thickened, gnarled bark. At first I could not believe the little ones belonged to them, but as soon as I put them on a saucer with a small chip of the bark, they both picked up the little ones on the chip and commenced to wash them; that decided the relationship. I prepared an ash block by making an excavation and placing in the bottom a piece of their tree-nest, being careful not to touch it with my fingers and so destroy the smell of their old home; and they now have the choice of a bark or ash cell with a glass roof, and have taken possession and seem contented. The imagos are about seven mm. in length, two and one-half mm. diameter. One has a white longitudinal stripe on the sides of the abdomen, the other has a yellow stripe, and the latter seems to be the male. Otherwise they look alike, and on my last view of them they were both washing the babies. Is it possible these eight larvæ, one and one-half mm. long, are from the first eggs laid, and then a rest? I await further observations of them with great interest.

This morning at 4 o'clock I looked at my blocks of termites and found a nympha with short wing-cases had just cast its skin, and I mounted it. You see they have to be constantly watched to find them in the act of moulting, and I desire to see those with the long wing-cases moult, to note the difference in appearance afterward.

MR. W. H. J. SIEBERG exhibited specimens of pottery exhumed in ancient graves at Inwood, N. Y.

The SECRETARY read the following paper by title:—